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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/647,247	08/26/2003	Hajime Yamamoto	031029	1773
38834	7590	10/04/2005	EXAMINER	
WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP 1250 CONNECTICUT AVENUE, NW SUITE 700 WASHINGTON, DC 20036			BARRECA, NICOLE M	
			ART UNIT	PAPER NUMBER
			1756	

DATE MAILED: 10/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.		Applicant(s)	
	10/647,247		YAMAMOTO ET AL.	
	Examiner		Art Unit	
	Nicole M. Barreca		1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>8/26/03</u> . | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION

1. Claims 1-20 are pending in this application.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claim 20 is rejected under 35 U.S.C. 102(e) as being anticipated by Choi (US 6,818,384).
4. Choi discloses a method for manufacturing a microelectronic features by forming intermixed layers of water-soluble resins and resist materials. The method reduces line edge roughness and e-beam shrinkage (col.1, 34-col.2, 7). Resist pattern 420 is formed on substrate 401 of for example, an ArF resist material. A second resist or coating layer 425 is formed on the resist pattern and on the substrate. The coating layer can be a water-soluble resin. A boundary 450 represents the intermixed layer. The structure is heated to a temperature in a range between about 80-150 C to cause portions of the resist pattern to intermixed with adjacent portions of the coating layer. Different times and temperatures may be used. The heating can also promote via a crosslinking agent, a crosslinking reaction. The thickness of the hardened intermixed layer is in the range of about 5-20 nm. The non-intermixed portion of the coating layer

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is removed (developed) by rinsing the structure. The coating layer may include a surfactant. The water soluble resin may be polyaromatic polymer resins such as poly(styrene carboxylic acid). The crosslinking agent can be diclycidylamino ethanol. Figure 5 illustrates that the shrinkage of the CD of the features (opening dimension) is less than that seen in conventional systems. See the examples wherein the width of the intermixed layer over the resist pattern was reduced only by 6 nm by the e-beam. See col.4, 15-col.6, 58 and examples.

5. Claims 1, 6, 14, 18-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Arita (US 6,905,949)

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

Chemically amplified resist such as an ArF resist, is formed on the polysilicon film 24 and patterned to form resist pattern 25. Resin film 26 is formed over the resist pattern at a thickness of about 400 nm. The structure is heated at a temperature higher than the softening temperature of the resist pattern and lower than the softening temperature of the resin film in order to eliminate the edge roughness of the resist pattern. The resin film is removed (developed) and the resist pattern is used as a mask to pattern the

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polysilicon film 24 (col.5, 1-62). The resin may include an organic solvent such as xylene and polyvinylacetal or polyvinyl alcohol (col.6, 37-67).

6. Claims 1-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Nozaki (US 2003/0170571)

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

7. A resist pattern improving material is used in method for manufacturing a semiconductor device wherein edge roughness is reduced. The resist pattern improving material comprises a water or alkali soluble composition comprising a resin selected from the group consisting of polyvinyl alcohol, polyvinyl acetal and polyvinyl acetate and a crosslinking agent selected from the group consisting of melamine, urea and uril derivatives. The composition may further include a water-soluble aromatic compound such as polyphenols and a non-ionic surfactant such as polyoxy ethylene-polyoxy propylene. See [0041]-[0057]. The composition may also include an organic solvent such as isopropyl alcohol. The resist improving composition is coated on the resist pattern (ArF resist). The structure is baked to promote mixing and crosslinking at the interface and developed to form a pattern having a reduced roughness. See [0063]-[0072]. Baking temperatures include 85 C and 90-100 C [0074]. The examples include

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increasing the opening dimensions of 3 nm for a 150 nm space pattern [0075]-[0082].

The amount of mixing is controlled by the coated film thickness, temperature and/or time for baking. The amount of variation of size of the resist pattern is controlled within the range of 10% or less and the amount of edge roughness is controlled to reduce the size of the pattern of 5% or less. See the claims.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 1-11, 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Choi.

10. The teachings of Choi have been discussed above. While Choi does not explicitly disclose etching the base layer, the reference teaches that the method is used to manufacture a microelectronic features by forming intermixed layers of water soluble resins and resist materials. It would have been obvious to one of ordinary skill in the art that the next step for manufacturing a microelectronics feature in the method of Choi was to etch the base layer using intermixed (smoothed) resist pattern because the conventional method to manufacture microelectronic features in the art includes etching with a resist pattern. The opening dimensions and thickness of the resist and material layers are result effective variables dependent on the required dimensions for the devices being produced and manufacturing conditions. It would within the ordinary skill

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of one in the art to determine the optimal dimensions and thickness by routine experimentation as these are a result-effective variables and the discovery of an optimum value of a result effective variable is ordinary within the skill of the art, as taught by *In re Boesch*, (617 F.2d 272, 205 USPQ 215 (CCPA 1980)).

11. Applicant cannot rely upon the foreign priority papers to overcome any rejection with an intervening reference because a translation of said papers has not been made of record in accordance with 37 CFR 1.55. See MPEP § 201.15.

Double Patenting

12. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

13. Claims 1-20 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-21 of copending Application No. 10/290,493. Although the conflicting claims are not identical, they are not patentably distinct from each other because both claim forming resist pattern with smoothed or reduced edge roughness using the same method steps which

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include applying a smoothing or resist pattern improving material to the resist pattern, heating and developing.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Conclusion

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Lin (US 6,627,388) discloses a method for reducing resist pattern roughness through a crosslinking reaction but does not develop after forming the material layer. Lu (US 6,753,117) discloses a method for reducing line edge roughness of patterned resist but does not disclose that the thickness of the additional material or heating temperature are adjusted to smooth the pattern.

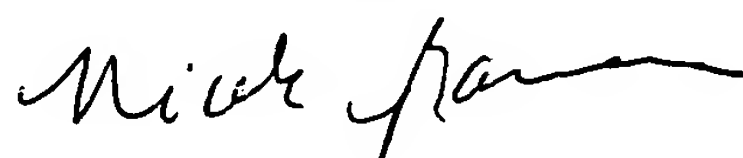
15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nicole M. Barreca whose telephone number is 571-272-1379. The examiner can normally be reached on Monday-Thursday (9AM-7PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F. Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Nicole M Barreca
Primary Examiner
Art Unit 1756



9/27/05